RESEARCH ISSUE 2017

WESTERN MICHIGAN UNIVERSITY

W Magazine

Rising Stars in Research

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An efficient edifice

Being a big loser isn't often something to brag about. But in reference to the College of Health and Human Services building, it's a point of pride. The facility captured the "Biggest Loser" title in the 2016 Michigan Battle of the Buildings energy savings competition in the education category. Results of the annual contest were announced at a 2017 Energy Summit in Grand Rapids, Michigan. The University demonstrated the greatest percentage-based reduction in energy-use intensity during the 2016 competition, with a 17.4 percent decrease in energy use in the 242,000-square-foot facility it entered. Open to all the state's commercial buildings, the annual competition is sponsored by the West Michigan Chapter of the U.S. Green Building Council, Consumers Energy and DTE Energy. The competition included 457 buildings in 10 categories.

Dear Friends,

Our decades in education have afforded us many opportunities to mentor students and young professionals. While it is always a privilege and an honor to share our knowledge and experiences with them, it has been equally rewarding to learn from these emerging leaders.

As Dan and I transition from our own leadership positions, we are gratified to see that upcoming generations are similarly passionate about improving life through their talents and interests. They have so much to contribute.

In this issue, you will meet several rising stars in research and in other realms—both students and early career professionals—committed to using their gifts to take on such weighty challenges as developing treatments for difficult-to-cure diseases, advancing neuroscience far beyond what we grasp today and even bettering our understanding of the universe. These highly skilled Broncos are creating new knowledge and solving real-world problems, which is truly inspiring.

As you read through this issue, don't miss the story looking back at a 12-year partnership between WMU and other Michigan research universities that has supported and guided thousands of students underrepresented in scientific and technical fields into transformational educational experiences and promising careers.

In short, in case you had any doubts, the future is in good hands.

We hope you enjoy learning about the impact of discovery that starts here at WMU and goes well beyond. It's been a great year, a great decade serving this fine institution and, as always, it's a great day to be a Bronco.

Best regards,

John M. Dunn, Ed.D.
President

Daniel M. Litynski, Ph.D.
Vice President for Research

University **News**

CommUniverCity will feature president's inauguration

An annual celebration of the partnership between Kalamazoo and WMU this year will include the inauguration of Dr. Edward B. Montgomery, the University's ninth president as of Aug. 1.

Montgomery will be inaugurated Friday, Sept. 15, during an 11 a.m. ceremony in Miller Auditorium. All are invited.

Montgomery

In addition to the presidential inauguration, weekend CommUniverCity events will include a Saturday, Sept. 16, evening of tailgating and football under the lights vs. the University of Idaho.

The inaugural celebration on Friday will begin with the formal Miller Auditorium event and be followed by additional celebratory activities.

Details about the ceremony and other inaugural activities are being added, as they become available, to an inauguration website at wmich.edu/inauguration.

Montgomery's appointment as president was announced April 12. He comes to WMU from Georgetown University, where he has served as dean and professor of economics at the McCourt School of Public Policy. He succeeds the retiring Dr. John M. Dunn. ■

An accomplished scientist and administrator, Dr. Sherine O. Obare will lead WMU's research operations for at least the next six months.

Interim vice president for research named

A researcher with a long track record of attracting external funding and collaborating on international research efforts has been named the University's interim vice president for research.

Dr. Sherine O. Obare, who has been serving since December 2016 as associate vice president for research, will assume the leadership role charged with guiding the University's research agenda. Her appointment is effective Aug. 1 and was made pending approval by the WMU Board of Trustees. She replaces Dr. Daniel M. Litynski who has served as vice president for research since 2010 and is returning to the faculty in the College of Engineering and Applied Sciences.

Obare is expected to serve in her interim role for a minimum of six months, while the University undertakes a national search for a permanent vice president for research. Her appointment was announced by President John M. Dunn, who retires this summer. Dunn made the decision to appoint Obare in consultation with President-designate Edward B. Montgomery.

A tenured full professor of chemistry who has been a WMU faculty member since 2004, Obare came to the University after completing a two-year Camille and Henry Dreyfus postdoctoral fellowship at Johns Hopkins University. She earned a bachelor's degree from West Virginia State University in 1998 and a doctoral degree in inorganic chemistry from the University of South Carolina in 2002.

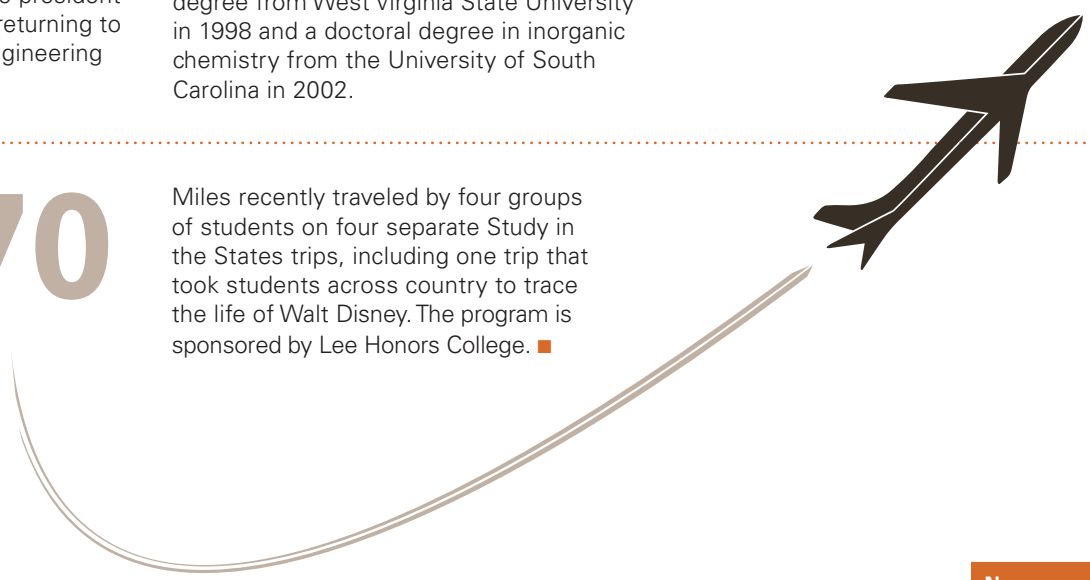
Prior to becoming associate vice president for research, Obare served for nearly two years as an interim associate dean of the College of Arts and Sciences. She also held the positions of associate chair and graduate advisor for the Department of Chemistry. In her various positions at WMU, she has served as a mentor to postdoctoral fellows, graduate and undergraduate students and high school and middle school students.

Obare's career at WMU has been characterized by research success and a number of accolades. She has garnered more than $4.5 million in external funding for her work, which includes developing materials for the detection and remediation of biological and chemical pollutants and understanding the environmental and health hazards of emerging materials. In addition, she has focused on developing strategies to improve education in the chemical sciences.

National awards she has received include the National Science Foundation CAREER award in 2006, the George Washington Carver Teaching Excellence Award in 2009, the International Union of Pure and Applied Chemistry Young Observer Award in 2009, the American Competitiveness and Innovation Award from the NSF's Division of Materials Research in 2010 and the Lloyd Ferguson Young Investigator Award in 2010. In 2013, she was named one of the top 25 women professors in the state by Online Schools Michigan. ■

16,970

Miles recently traveled by four groups of students on four separate Study in the States trips, including one trip that took students across country to trace the life of Walt Disney. The program is sponsored by Lee Honors College. ■



Industrial engineer named national fellow

Dr. Steven E. Butt was recently named a fellow of the Institute of Industrial and Systems Engineers. Being named a fellow is the highest classification of membership in the organization.

Butt

The accolade recognizes outstanding industrial and systems engineering leaders who have made significant, nationally recognized contributions to the profession. WMU now has four fellows, which as a percentage of industrial engineering faculty, is one of the highest percentages of fellows at any institution.

Butt is professor and chair of two academic units at WMU: the departments of Engineering Design, Manufacturing and Management Systems, and of Industrial and Entrepreneurial Engineering and Engineering Management.

The other three faculty members who have been named IISE Fellows, along with the year they were named, are: Drs. Tycho K. Fredericks, 2015; Timothy J. Greene, 1999; and Kailash M. Bafna, 1996. All three are professors of industrial and entrepreneurial engineering and engineering management. In addition, Greene served as WMU's provost for nine years and Bafna also is a professor of engineering design, manufacturing and management systems. ■

Journalism students pen issue of southwest Michigan magazine

What would college journalists choose to write about if they were given an entire magazine to fill with their best work?

Professor Sue Ellen Christian, standing, meets with her students.

That question is answered by an issue of *Encore Magazine*, a lifestyle magazine based in Kalamazoo and serving southwest Michigan. The May 2017 issue was written almost entirely by junior- and senior-level WMU journalism students taught by Professor Sue Ellen Christian in the School of Communication.

For their senior capstone experience, five aspiring journalists—Carolyn Diana, Samantha Marzke, Samantha May, Jay Penny and Greyson Steele—conceptualized, reported, researched and wrote the feature articles in the magazine.

Among the stories is an in-depth feature on how technology has revolutionized the academic and social lives of college students. There's also a montage on how dorm décor has evolved over the decades.

To view the digital version of the magazine, visit bit.ly/2pLBlUn. ■

Psychologist feted for scholarly impact

Dr. Douglas Johnson, assistant professor of psychology, is the first recipient of a new award to honor the impact research is having in the area of organizational behavior management. Named the Scholarly Impact Award, it was announced during the annual Association for Behavior Analysis International Convention in May.

Johnson

The honor was created by the Organizational Behavior Management Network and *Journal of Organizational Behavior Management*. The OBM Network is the top professional organization for the application of behavior analysis to workplace settings, and the journal is the flagship publication for the discipline. It will be an ongoing annual award.

Johnson, who serves as director of undergraduate training for the psychology department, was selected as the first recipient based on two of his *Journal of Organizational Behavior Management* articles. One article received the most citations for this year while the other was the most cited in 2013. ■

Quoted on campus:

"'Not even the sharpest blade can cut its own handle.' Children have this tremendous potential in all kinds of fields and areas, but no matter how bright they are, they can't cut their own handle. They can't make themselves useful in certain ways; it's what we do."

—Former NASA Astronaut Mae Jemison first quoted a proverb to implore adults to help youths reach their potential. Jemison was on campus in March headlining a Kalamazoo Community Foundation event and as part of a University Center for Humanities' speaker series.

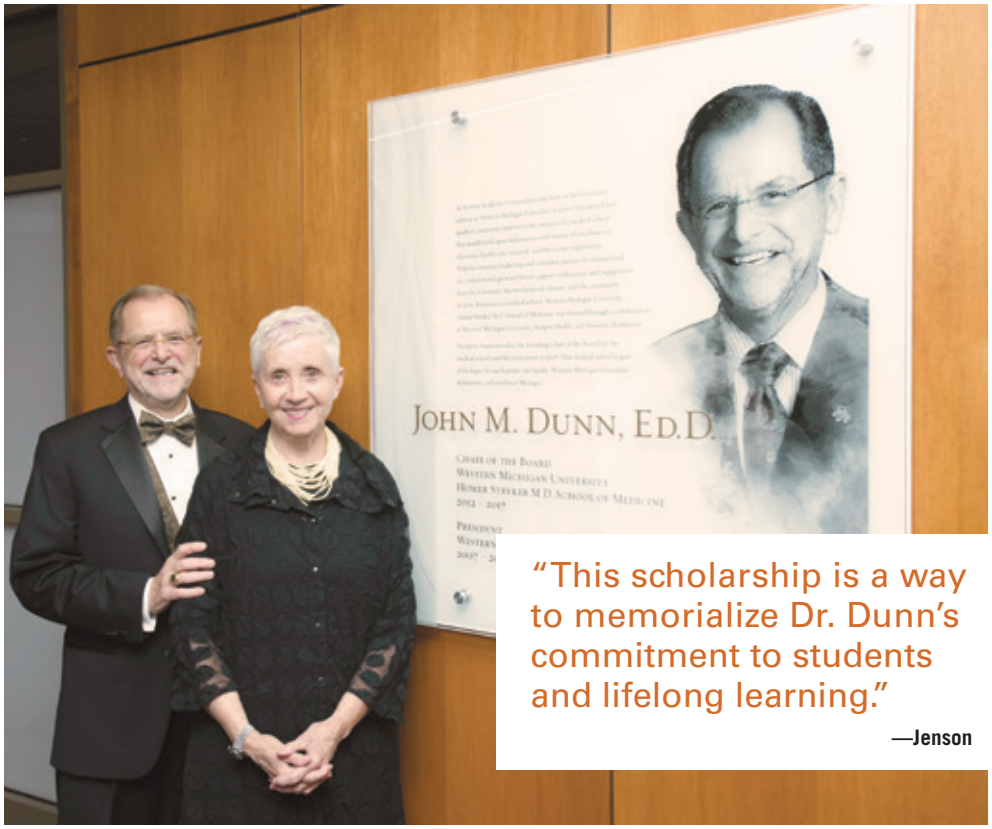
Med school scholarship honors Dunn, benefits WMU alumni

A decade of devotion to students by President John M. Dunn has been honored by members of the Kalamazoo community with a $2.2 million endowed scholarship fund in his name that will support medical students.

With his retirement looming, Dunn's vision and student focus will live on in perpetuity at the WMU Homer Stryker M.D. School of Medicine, with the establishment of the John M. Dunn Endowed Scholarship. Each year, the award will cover more than $100,000 in tuition for eligible WMU graduates who are admitted to the medical school's M.D. degree program.

The newly endowed scholarship was revealed to Dunn and the community May 20, at the medical school's second annual Imagine Gala. The announcement was made by Ken V. Miller, who is both chair emeritus and a current member of the WMU Board of Trustees.

"This scholarship fund in honor of Dr. John M. Dunn recognizes the key role he has played in developing Kalamazoo's medical school and, perhaps more importantly, it benefits our WMU graduates who are moving on to attend the medical school," Miller said. "Students have always been, and will continue to be, what is most important to President Dunn."



"This scholarship is a way to memorialize Dr. Dunn's commitment to students and lifelong learning."

—Jenson

Dr. John and Linda Dunn pose with his newly installed plaque at the WMU School of Medicine.

The scholarship fund is endowed with $2.2 million in financial contributions from key community leaders, members of the WMU Board of Trustees, Borgess Health, and Bronson Healthcare. The initial funding target of $1.2 million was exceeded due to generous support.

"We are overjoyed with the community support to establish this new scholarship fund for our future medical students," Dr. Hal B. Jenson, the medical school's founding dean, said. "This scholarship is a way to memorialize Dr. Dunn's commitment to students and lifelong learning."

During his first year as president of WMU, Dunn sparked community interest in the creation of a medical school that would build upon Kalamazoo's history in education, health care, research and life science exploration. He championed the endeavor and garnered broad support, enthusiasm and engagement from the University, Kalamazoo's two hospitals—Borgess Health and Bronson Healthcare—donors and the community.

In 2011, the medical school became a reality, formed through a collaboration of WMU, Borgess Health, and Bronson Healthcare. President Dunn serves as the founding chair of the board for the medical school and will continue in that role until his retirement on July 31.

"The journey has been a fabulous journey, and it has inspired many within the city of Kalamazoo, within our Western Michigan University community, within southwest Michigan. And that inspiration is part of the aspirational gift that John Dunn has given to each and every one of us—to all of the students, to all of the possibilities there are for all of us in the future," William D. Johnston, a member of the WMU Board of Trustees, said at the gala as a large crowd toasted Dunn and his wife, Linda.

When it was his turn to speak following the announcement of the scholarship fund in his honor, Dunn said he was "overwhelmed" by the news.

"The bottom line is I'm just a small-town kid from southern Illinois and in many ways that has served me well through the years because when you're from a small town in southern Illinois you learn that it's about everybody, it's about other people, it's about trying any way you can to improve our society and make things better." ■

RISING STARS IN RESEARCH

The stories in "Rising Stars in Research" share a common thread. Each person displays a curiosity rooted in a passion to understand. Knowledge for knowledge sake, however, is not the driving force. Rather, the drive to explore and ask questions is to find answers that add value to the world.

This year, for instance, three professors—the most in any single year at WMU—have garnered a coveted National Science Foundation CAREER award, a top prize for early career scientists.

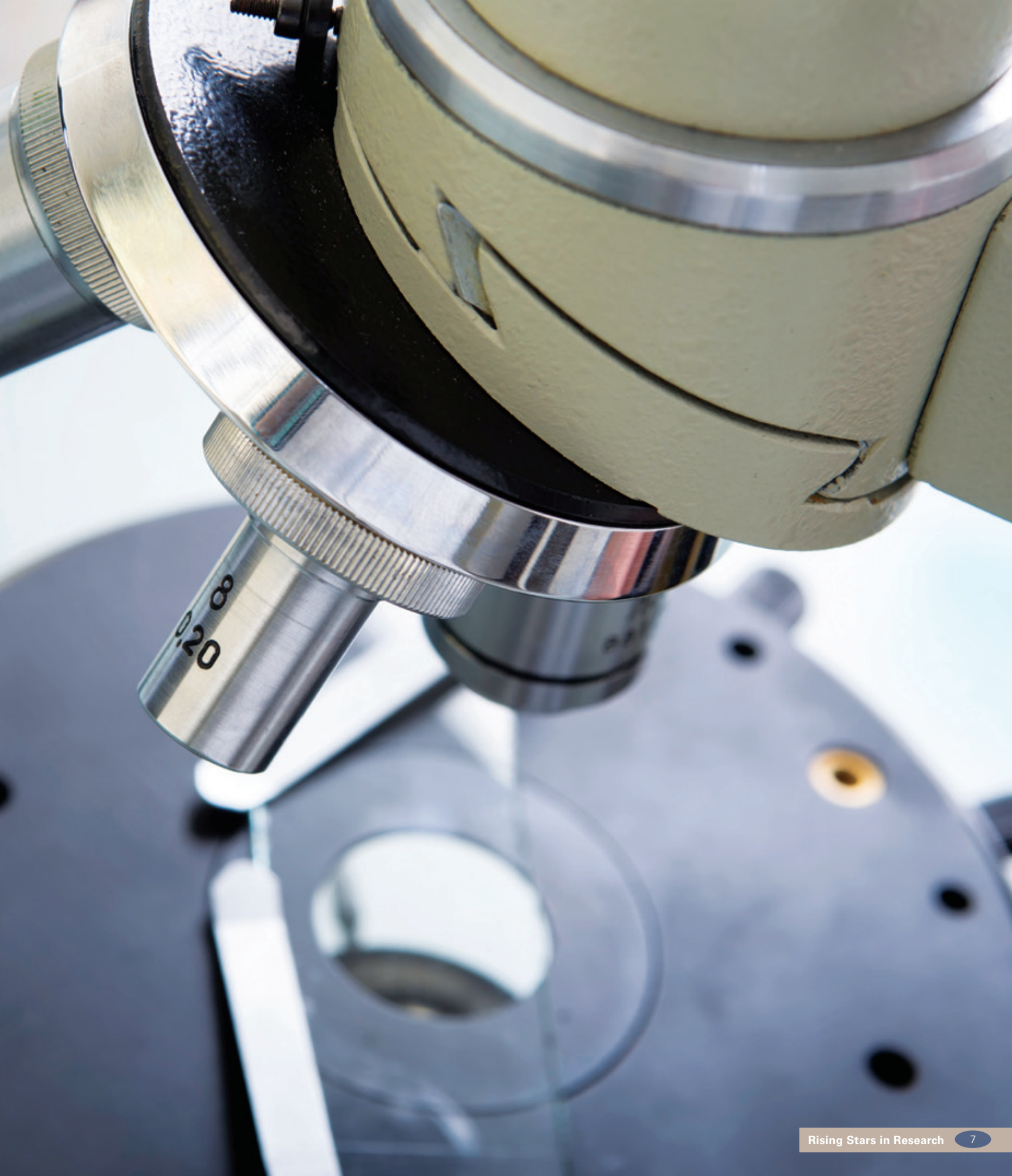
Those who earn the award and accompanying grant, "have the potential to serve as academic role models in research and education and to lead advances in the mission of their department or organization," according to the agency.

For the individual faculty members and the University as a whole, the recognition is a high honor.

But more than that, these scientists—Drs. Wendy S. Beane, Elena Litvinova and Fahad Saeed—are generating new knowledge and real-world solutions to advance such areas as human health, nuclear physics, computing science and medicine.

And alongside the University's researchers—CAREER award recipients and others—is the next generation of ascending scientists, following in the footsteps of their mentors, learning new skills and figuring out how to use their own gifts in ways that also address some of society's most critical needs.

A handful of WMU talents are profiled on the following pages, but they represent so many others who share an innate need to explore, understand and contribute.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Algorithms for life

What these computer algorithms uncover about genes and proteins may one day advance drug development and individualized medical treatment

As a computational scientist, Dr. Fahad Saeed's research projects are all about bigness—big numbers, big data and big ambitions.

His latest endeavor, funded by a coveted National Science Foundation CAREER award grant, is no exception, as it builds on some of the biggest breakthroughs in biological sciences.

But what role could a computational scientist play in biology?

First, about those breakthroughs.

In 2003, the Human Genome Project achieved its stunning goal to sequence and map all the genes in the human body, which has about 20,000.

Another spectacular, more recent advance came with the ability to map an organism's proteome, or its full complement of proteins. Humans may have upwards of one million.

Scientists say both achievements, separately and together, hold keys to how the human body works fundamentally; and not just natural, normal processes, but how and why things go awry and result in disease and dysfunction. Recall that genes give instructions while proteins carry out those orders.

But the massive amount of data produced by sequencing both these "omes" is large and complex; it is not humanly possible to sift through and make sense of the multitude of interactions and pathways that exist to control the thousands of genes and proteins.

"So, while it is very exciting that we have big data from the genome and that we have big data from the proteome, it's also a challenge because the techniques that allow us to analyze those data sets are lagging behind," Saeed says.

This is where biological science turns to experts with Saeed's advanced skillset in computational science to develop computer algorithms that analyze "big data" to do such things as eliminate irrelevant information, pinpoint biological interactions and, particularly in the case of proteomics and genomics, possibly decipher previously unknown or little understood functions of proteins or genes.

"Without computational biologists, the vast amounts of raw data collected by bench scientists would remain meaningless," says Dr. Jason Hoffert, a National Institutes of Health scientific review officer who has worked alongside Saeed on projects in the past.

"At the same time, bench scientists play a key role in interpreting the cleaned data sets in order to draw meaningful biological conclusions."

CAREER
Award

As one of WMU's three recipients of a National Science Foundation 2017 CAREER award, Saeed garnered his associated $500,000, five-year grant to achieve an ambitious goal.

Based in WMU's College of Engineering and Applied Sciences, Saeed specializes in high-performance, high-speed computer algorithms designed to break down big data sets into discernible information.

He's an assistant professor both in the department of computer science and in the department of electrical and computer engineering and directs the Parallel Computing and Data Science laboratory at the college.

He's developing computer algorithms capable of analyzing massive amounts of genomic and proteomic data more efficiently than any previous techniques as well as designing architecture with the capacity to store, manage and transfer this data.

To give a sense of the "bigness" of the biological data this project will grapple with, Saeed explains that currently "some of the data sets we can produce are up to 10 terabytes (1,000 gigabytes), and that is just for one experiment for one species."

"If you combine data sets (genomic plus proteomic), they get into the petabyte level (1,000 terabytes), and the computational challenges just get exponentially larger and more complex, and that is what the grant proposes to solve."

The magnitude is so large, it's difficult to imagine. For perspective, one petabyte is the equivalent of 20 million four-drawer file cabinets filled with text, according to mozy.com.

What Saeed's algorithmic tools help life sciences researchers tease out about genes and proteins may lead to advances in drug development and individualized medical treatment.

Ultimately, Saeed says, "We want to take this genomic and proteomic science to a place where we are able to do genomic and proteomic profiling of each person who goes to a clinic. That is what we call personal or precision medicine.

"If you are able to profile genomes and proteomes at the individual level, we are able to very specifically know what diseases you might be prone to and what are the things we can do to make sure you do not get those diseases."

However, he concedes that nature is very complex. "It will take a lot of time to really know in a very systemwide level what is going on with our bodies. But we will reach that."

Saeed hopes computational tools he is designing will help make "crucial steps toward understanding the genomic, proteomic and evolutionary aspects of species in the tree of life." ■

Uncovering an **'exciting world of discovery'**

A recipient of a National Science Foundation CAREER award—the agency's most prestigious prize for junior faculty—Dr. Wendy S. Beane is gratified that her award's associated $800,000 grant will support her study of the extraordinary regenerative abilities of certain organisms.

But equally important for the assistant professor of biological sciences are the research opportunities she will offer students.

Her own career is directly tied to an unexpectedly focus-shifting experience with scientific discovery in college.

In her last semester of undergraduate study, Beane needed one final required course to earn a bachelor's degree in English. It was a science course. And she was dreading it.

Shifting to science

"I had biology, chemistry and physics in high school and, unlike my English class, they were excruciating experiences. As a point of comparison, my English teachers were not weary like my science instructors were," she says.

But that dreaded college science course turned out to be pivotal. In it, she discovered that science was fascinating, even exhilarating. And she was hooked.

"In the same way that English excited me to do research into a piece of literature and place it within the societal context, science in the physical lab excited me," she recalls. "All kinds of questions surfaced for me that I am still seeking to answer."

Instead of pursuing a graduate degree in English, Beane took additional biology courses. She continued to advance and eventually earned a second bachelor's degree in biomedical sciences.

"The engaged professors and exciting discoveries in the lab are what hooked me," she says. "That's why this CAREER award is so important to me. I can continue my research in the lab while engaging with my students, showing them the exciting world of discovery."

The Beane lab

In Beane's research laboratory, one of the many projects underway is understanding why some organisms, like planarian flatworms, are able to regenerate the brain and nervous system, while humans cannot.

"We can cut a planarian flatworm below the head and above their tale and it will quickly grow a new head and body," Beane says.

"We are studying how these worms are able to regenerate, growing new tissues and cells. Importantly, despite their differences, humans and planarians both possess central nervous systems and have numerous genes in common."

However, unlike humans, who have limited abilities to regenerate and regrow tissues, planarians can not only regenerate, but adapt new tissues to the size and shape needed.

"It is all patterning," Beane says. "We want to understand why they can regenerate proportionally in hopes this will help us understand other species and human regeneration."

What it all means to Beane

For a pre-tenured faculty member like Beane, this NSF CAREER award is significant as it empowers a faculty member to focus on his or her research agenda with a secure source of funding.

"What this award does is it gives me one large grant that goes on for a long time," Beane says. "I have more security, more time to build my reputation, to build my research, and to get things done. It gives me a leg up in my career, research-wise."

The National Science Foundation CAREER award is unique in that it is a long-term, five-year grant. Typically, grants last three years. The CAREER award allows early career faculty to focus on building their reputation and adding to the body of research in their field.

A significant component of this award gives Beane resources that enable her to engage in meaningful educational outreach. NSF reviewers are looking for grant submissions from faculty who engage students in research.

"What this award does is it gives me one large grant that goes on for a long time," Beane says. "I have more security, more time to build my reputation, to build my research, and to get things done. It gives me a leg up in my career, research-wise."

—Beane

Before submitting her grant proposal for the NSF CAREER award, Beane ran a pilot study in a school system in Gobles, Michigan, a small town near Kalamazoo.

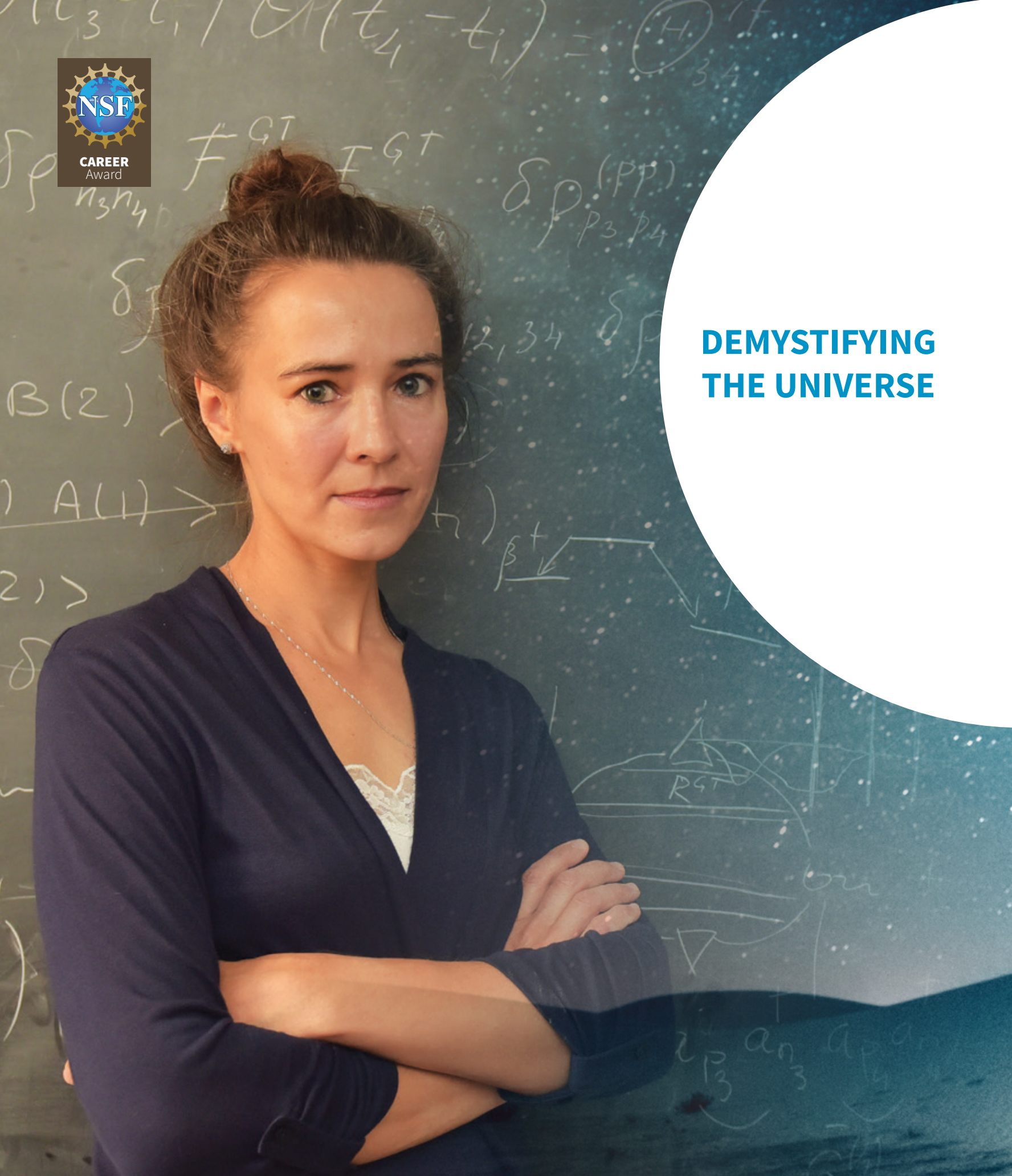
The pilot study included lectures, advising high school students on career options for biology majors and a practicum/lab component. In the practicum, students conducted experiments. Because Beane already was working on outreach, her proven record of involving students in research made her grant application all the more attractive.

"The lab is where the focus of engaging the students occurred," Beane says.

"In collaboration with our undergraduate biology advisor and the Gobles public school instructor, we brought in some worms and let the 85 students do experiments. After we left, the instructor kept working with the students to observe the results. They made hypotheses and waited to see what transpired."

The students loved the hands-on discovery. In fact, one of the students so loved working in the lab she decided to attend WMU to major in science. Today, she is working in Beane's lab as an undergraduate. ■

Learn more about Beane's research and how she has engaged students in that work on page 14.



NSF CAREER Award

DEMYSTIFYING THE UNIVERSE

Poets have long found their inspiration in the stars, their imaginations soaring to the outer reaches of the universe.

And so, it may just make poetic sense that Dr. Elena Litvinova, one of this year's recipients of the National Science Foundation's CAREER awards, is not only an assistant professor of physics at WMU, but, tucked among her degrees in physics, engineering and mathematics, is a master's degree in literature and poetry.

Litvinova finds virtue in how words illuminate natural phenomena and in the equations that also explicate the physical world.

She expresses the mystery of the stars best through her research in physics.

"When I was 14 years old, I read about quantum mechanics, Einstein's relativity theory and Riemann's geometry," Litvinova says. "I was fascinated by the beauty of ideas embodied in the physical world, and this fascination has stayed with me throughout my entire life. I am extremely happy being engaged in advancing these ideas in my research and in sharing them with students, colleagues and a broader audience."

The multi-talented professor not only enjoys her work as researcher and teacher, she's good at it. The NSF took notice and is awarding Litvinova with its most prestigious and competitive award in support of junior faculty.

Advancing her field

Litvinova's grant, which is in process and amounts to about $475,000, will support a project titled "From fundamental interactions to emergent phenomena: geometrical aspects of nuclear dynamics."

The research, she says, explores three major questions:

- How complex many-body dynamics—such as complex assemblies of forces and interactions—generate nuclear shapes;
- How atomic nuclei behave at high temperatures;
- And in atomic nuclei, what mechanism underlies superfluidity—the property of flowing without friction or viscosity.

As training the next generation of researchers is a key aspect of the award, "Our team will include two graduate students and a postdoctoral researcher, who will be carefully selected through an international search," Litvinova says.

"Besides engaging graduate students in this research, the project includes outreach and education activities, such as art-science exhibitions and graduate courses, aimed at broadening the impact of the performed research and at attracting young talents to the field of nuclear physics."

Herlik Wibowo, a doctoral physics student at WMU and a Fulbright Scholar, has been working with Litvinova on one of the three major tasks of her winning project.

"This is a theoretical nuclear physics project as we do not run any experiment to obtain data," he says.

"Instead of collecting the data from the experiment, we are developing a mathematical model to explain the experimental data. We are trying to gain a better understanding of the behavior of protons and neutrons when the atomic nucleus is subjected to external disturbances from gamma-rays or other particles."

Wibowo says that the obtained model can be useful in many ways.

"In the field of nuclear physics, a well-developed model will provide accurate information pertaining to several nuclear properties, such as mass, radius, decays and so on. In the area of nuclear astrophysics, the new model will provide a better understanding of r-process nucleosynthesis, which is the process describing the formation of elements heavier than iron."

Novel ideas

Litvinova explains that low-energy nuclear physics has entered a new era with the advent of facilities that provide beams of radioactive, or unstable, atomic nuclei.

"Collecting experimental information about such exotic systems plays a key role for understanding the elemental composition of the universe and for predicting the evolution of stars and galaxies," she says.

"Nuclear theory is another important source of information about exotic nuclei, which are not accessible experimentally, but needed for a complete picture of the universe."

However, in spite of the many advances made in decades of research, a global high-precision theory for the description of structural properties of nuclei is still a challenge, she says.

"The presently available approaches to nuclear structure have constraints, such as limited applicability or a restricted treatment of complex nuclear dynamics, or correlations, which are crucial for the precision of the theoretical description. This project addresses both issues by implementing novel ideas about nuclear dynamics and by benchmarking the theory with newest experimental data."

Litvinova has been advancing research in nuclear physics at WMU for about four years.

Originally from Russia, she earned her doctorate from the Joint Institute for Nuclear Research in Dubna, Russia, in 2003. She became a senior scientist at the Institute of Physics and Power Engineering in Obninsk, Russia, and joined the Technical University of Munich, Germany, in 2005 as an Alexander von Humboldt Fellow.

She worked as a research associate at GSI Helmholtzzentrum fur Schwerionenforschung in Darmstadt, Germany until 2012. She then moved to Michigan State University as a Facility for Rare Isotope Beams Theory Fellow in 2012. She assumed her current roles as an assistant professor of physics at WMU and as adjunct assistant professor at Michigan State in 2013.

"WMU offered excellent opportunities to work in research and higher education," Litvinova says. "To work here as a faculty member was a unique chance to make a difference in our field of research and for my professional development." ■

An eye for regeneration

Researcher's innovation aids scientists studying a flatworm's special ability

Saad

Ever since scientists discovered the extraordinary ability of planarian flatworms to regenerate missing tissue, there has been a demand for new assays into how these animals could be used to identify potential therapies for human healing.

Now, a team of WMU researchers is providing the foundational groundwork that will help scientists take the next step in exploring the specimen's regenerative potential.

Two Lee Honors College students teamed up with Dr. Wendy S. Beane, assistant professor of biological sciences, to develop a new surgical procedure for removing the eyes of planarian flatworms and studying the mechanics of how the organs regrow.

The student duo—recent graduate Jacob Morton and sophomore Marwa Saad—wrote a peer-reviewed manuscript describing the technique, which was published in the *Journal of Visualized Experiments.* The article is also the basis of a professional video that teaches the procedure through demonstration.

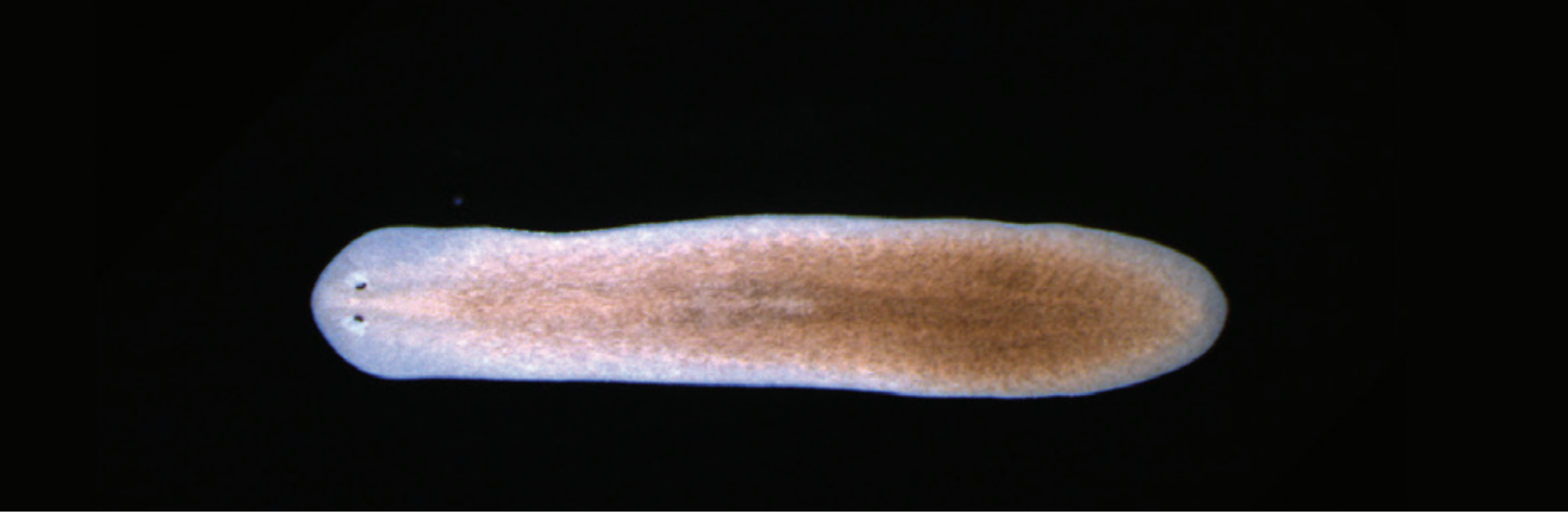
> "New techniques such as this can help scientists study the relevant tissues in the most controlled way possible."
>
> —Morton

Link to human genes

What does this research mean for humans? Planarians are known to possess genes and a nervous system remarkably similar to our own. By studying how these features react as the worms regenerate missing body parts, scientists might move one step closer in learning to grow human tissue and cells.

And these discoveries could lead to extraordinary medical advances—regrowth of an amputated limb, creating insulin-producing cells for people with diabetes or completely restoring nervous system function after a spinal cord injury. The WMU study examines eye regeneration in particular, and allows for a closer look at the mechanisms involved in visual system regrowth.

"Eye injuries and eye disease are a big health and economic problem," Beane says. "We wanted to study the genes and signals that are involved in planarian eye regeneration because they have the ability to recreate the entire eye, not just individual tissues like the retina or lens. To do that effectively, we needed a technique to remove just the eye while leaving the underlying brain and other tissues intact."



An unprecedented technique

In the past, eye regeneration has been studied primarily in the context of decapitating the flatworms.

"The process is incredible because the whole head regrows, including the brain, but it makes it difficult to tease out the mechanisms that are eye specific," Beane says.

In an unprecedented technique using insulin needles intended for diabetic cats, Beane and her students scoop out the flatworm's optic cup, leaving the brain and other tissues behind. They can then examine the regrowth activity related solely to the eye.

"New techniques such as this can help scientists study the relevant tissues in the most controlled way possible," Morton explains.

> "We wanted to study the genes and signals that are involved in planarian eye regeneration because they have the ability to recreate the entire eye, not just individual tissues like the retina or lens."
>
> —Beane

Virtual instruction

Filming of the instructional video took place at Haenicke Hall in February, with Morton and Saad in the spotlight. Beane says that recording the procedure makes the research much more accessible and eliminates the expense of travel for interested scientists.

"The video aims to increase the reproducibility of the research by physically demonstrating the technique," she says. "In other words, when a written description isn't enough, the video can take scientists step by step through the process. In the past, those who wanted to learn ablation procedures had to find someone willing to teach them, travel to a lab and watch them do it. The nice thing about this article and video is that people can get training without the expense of tracking down an expert."

In addition to being at the forefront of their research, Morton and Saad are getting the unique experience of being teachers and published journal article authors as undergraduates.

Saad, who came to WMU from Egypt on a full academic scholarship, says the process was "very exciting and important" for her. She plans to pursue a doctorate with the goal of being a researcher in the biomedical field.

Morton begins his medical education at the WMU Homer Stryker M.D. School of Medicine in August. He says having a successful undergraduate research experience will help prepare him for the work required in medical school. ■

Artful science

A venture called the STEAM Project brought together chemistry, music composition and visual arts students to collaborate on art works this past academic year. STEAM stands for science, technology, engineering, arts and mathematics.

Students analyzed substances—such as beer, coffee and tea—from local businesses to create art based on data delineating the chemical makeup of their chosen substance.

They developed works representing their scientific findings, both sonically and visually, and were able to explain those ideas to the general public, says Dr. Andre Venter, an associate professor of chemistry who led the project with Dr. Lisa Renée Coons, assistant professor of music, and Patrick Wilson, assistant professor of art.

The finished pieces were displayed/performed on campus and in downtown Kalamazoo.

The sculpture shown here, accompanied by original music, represents an ion chromatogram of solid-phase, micro-extracted headspace of a Boatyard Brewing Co. IPA analyzed by gas chromatography mass spectrometry. Carolyn Borcherding, music composition graduate student, Jake Kirkendall, chemistry major, and Sara Wild, art major, worked together to create this particular sonic, visual and scientific experience.

"Normally," Kirkendall said, "the arts and sciences don't collaborate. But the big idea here was that it's something we should be doing. It's a good experience for both sets of students. We're all pulled into and get an appreciation for each other's worlds."

From soldier to scientist

From wounded to regenerated

U.S. Army airborne medic Jayme Hentig was parked in an ambulance in Afghanistan when a traumatic event changed his life in an instant.

A culvert beneath his ambulance collapsed, sending the heavily armored vehicle violently tumbling 25 feet. Inside, Hentig suffered blows to his head, causing a brain injury so severe, he spent a year rehabbing and was medically retired from the Army after four years of service.

"That sat pretty heavy on me," he says.

It meant leaving the soldiers he had been serving with as a member of the 173rd Airborne Combat Brigade. It meant his lifelong plan to spend his career in the Army was at a premature end.

But the unenviable circumstances also set Hentig on an unexpected path to pursue brain research at WMU as he sought to understand his own injury and perhaps advance the science aimed at improving outcomes for others who have suffered head trauma.

Never far from his thoughts are the thousands of U.S. soldiers who return home with severely battered brains and dramatically altered lives.

This is one of Hentig's favorite pictures from his military days. The U.S. Army issued him a certificate of appreciation for re-enlisting.

"So many don't have the opportunities I do," he says.

Hentig graduated from WMU with honors last year and began a doctoral program at the University of Notre Dame studying neuroscience and neuroregenerative medicine.

He recently won a National Science Foundation fellowship and associated $138,000 research grant.

With it, Hentig is investigating the Holy Grail of neuroscience—how to regenerate damaged human brain cells, a pursuit he started under the guidance of his mentor, Dr. Christine Byrd-Jacobs, professor of biological sciences and acting dean of WMU's Graduate College.

"I can't say enough about her," Hentig says. "She taught me how to be a researcher."

Poised to persevere

Pursuing research was quite a turnabout for someone who came to the University five years ago as a plan B; a college education was never previously a consideration for him.

Plan A, the 27-year-old says, was to be a military lifer; that was his thinking when he joined the Army as a high school junior from Rockford, Michigan.

Coping with his own brain injury, wounded veteran-turned-researcher Jayme Hentig is pursuing the Holy Grail of neuroscience—how to regenerate damaged brain cells.

> "The military was a way to get out and go see the world. And I thought of it as a way of learning something that was more important than school, to learn things they don't teach you in school, like how to persevere."
>
> **—Hentig**

"The military was a way to get out and go see the world. And I thought of it as a way of learning something that was more important than school, to learn things they don't teach you in school, like how to persevere," he says.

Lesson apparently learned.

After plan A dissolved as a result of his injury, Hentig was determined, though with strong apprehensions, to at least try to make use of his GI Bill education benefits. He enrolled at WMU in 2012 wondering whether he could handle academic study given the lingering effects of his injury.

During his year of rehabilitation, he had learned strategies to compensate for impaired memory and reaction time. And though he experienced significant improvement, two words in his medical report still gnawed at him—cognitive deficit.

But that didn't stop him.

In Hentig's first semester, he surprised himself by earning a 4.0 grade-point average. And as he gained confidence, he increasingly challenged himself, taking on programs of study he previously thought were out of reach, ultimately deciding to major in biomedical sciences en route to medical school.

Continued on page 33

Engineered for brain science

Alexandra Ferguson wants to blaze a trail into the final frontier of the human body—the complex and still little-known realms of the brain.

And even at 22 years old, she, along with the help of other researchers at WMU, has made discoveries she hopes will one day lead to more efficient and effective treatments for diseases like Parkinson's and conditions such as Obsessive-Compulsive Disorder.

"I'm drawn to the complexity of the brain," she says. "We use it to think, to reason, to problem solve, but we know so little about it. It's my goal to understand it better."

The Livonia, Michigan, native and daughter of a Ford Motor Co. electrical engineer, Ferguson thought she would study one of the natural sciences. But after committing to WMU in 2012 as a Medallion Scholar, she followed in her father's footsteps, graduating in the spring of 2016 with a degree in electrical engineering.

That same year, Ferguson became one of only 180 students nationwide to receive the prestigious National Defense Science and Engineering Graduate Fellowship. And this year, she earned a master's degree in the same field through a one-year, accelerated graduate program offered in the College of Engineering and Applied Sciences.

Now, she's off to perhaps the most prestigious technical school in the world— the Massachusetts Institute of Technology—to begin a doctoral program where she plans on building on her expertise developed as an undergraduate at WMU.

"Neuroscience is an exciting field right now," she says. "It encompasses physics, chemistry, math, biology and many other disciplines. I see neuroscience as a melding of these fields, where researchers apply tools from many disciplines to study the brain."

During her sophomore year, Ferguson began working in the Neurobiology Engineering Laboratory of Dr. Damon Miller, associate professor of electrical and computer engineering.

In collaboration with faculty members in math and biology, including Dr. John Jellies, a professor of biological sciences known for his research into leech neural circuits, Ferguson and Miller applied mathematical models and fine-tuned delicate procedures and techniques to study how individual neurons respond to patterns of electricity.

Their goal is to find smaller electrical stimulation currents that yield the same neuron responses as higher currents in leech neurons. Doing so could have the potential to treat neurological diseases, possibly impacting therapies like deep brain stimulation, used in maladies such as Parkinson's disease and epilepsy.

"My professors at WMU were invested in me and my success," Ferguson says. "The smaller class sizes allowed for me to be involved in my learning more. I felt like they really cared.

"To be involved with such important research at such a young age, and (with projects that have) the potential to help many people, I think really shows how much my professors believed in me."

To say that Miller, who was a mentor and faculty advisor to Ferguson, is impressed with her is an understatement.

"I smile every time I think of her heading to MIT," Miller says. "Students are a joy to work with, but some rise to the top and are just extraordinary. She is one of the rare ones, and now she's heading to one of the top technical schools in the world."

He adds with a laugh, "We tried really hard to keep her here. Maybe she'll hire me some day."

Like most remarkable students, Ferguson was involved in much more than just academic pursuits during her time at WMU.

The litany of activities and student organizations she immersed herself in shows that she squeezed every last drop out of her time in Kalamazoo: the Society of Women Engineers, three-time participant in Alternative Spring Break, volunteer work in the community and five years as a trumpet player in the Bronco Marching Band, playing in front of 80,000 people at this year's Cotton Bowl.

Of that last experience, she says, "It was incredible. The whole (football) season was like magic."

But now the hallowed halls of MIT await her. When she's completed her doctorate, Ferguson says she sees herself back in the world of academia, teaching and researching, following, in many ways, in the footsteps of her mentor.

Ask her if she's nervous about embarking on this new adventure and she shrugs her shoulders.

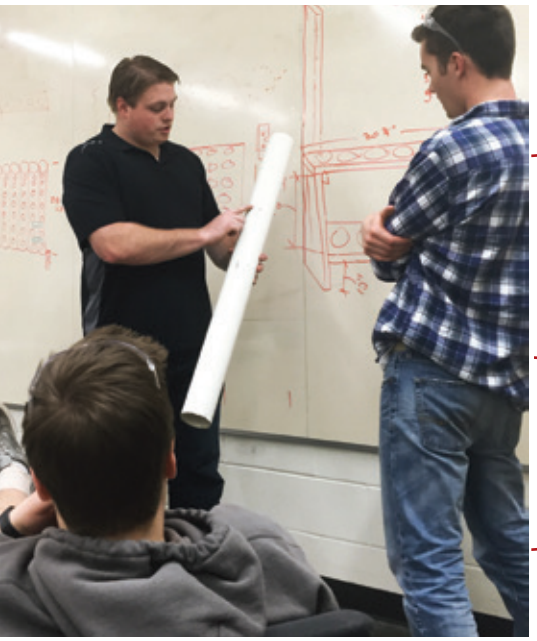
"It's going to be tough, for sure," she says. "I'm going to be with the best of the best. But it's all going to be fine, I think. I don't think I would be in this position— the path of research—if I had gone to some place other than WMU for undergraduate study. But here I am, and I'm prepared." ■

"I'm drawn to the complexity of the brain. We use it to think, to reason, to problem solve, but we know so little about it. It's my goal to understand it better."

—Ferguson

Innovative *by design*

While training in California, Puckett and LaWarre acquired a new mentor—Kevin Khaw, center, a WMU alumnus and a manager for Google. Khaw is profiled on page 32.



This fall, undergraduates Nathan LaWarre and Jill Puckett will teach their younger counterparts in some first-year seminar classes how to use "design thinking," a technique intended to strategically solve complex problems.

"There are steps you go through, a lot of it involving collaborating with other students, getting outside input for your ideas and rapid prototyping on the spot," LaWarre, a computer engineering major, explains.

"Through our training, we found you can implement design thinking into anything," whether your goal is to, for example, make a product or create a marketing campaign.

How to use design thinking is just one of the lessons LaWarre and Puckett learned and plan to implement at WMU through their training as University Innovation Fellows, a program run by Stanford University's Hasso Plattner Institute of Design.

Innovation fellows

LaWarre and Puckett are WMU's resident fellows, but they are among a class of 224 University Innovation Fellows from 58 higher education institutions and seven countries. The program intends to empower student leaders to be agents of change at their respective schools by increasing campus engagement with innovation, entrepreneurship, creativity and design thinking.

Fellows work to ensure that their peers gain the knowledge, skills and attitudes required to compete in the future economy and make a positive impact on the world. They design innovation spaces, start entrepreneurship organizations, host experiential learning events and work with faculty to develop new courses.

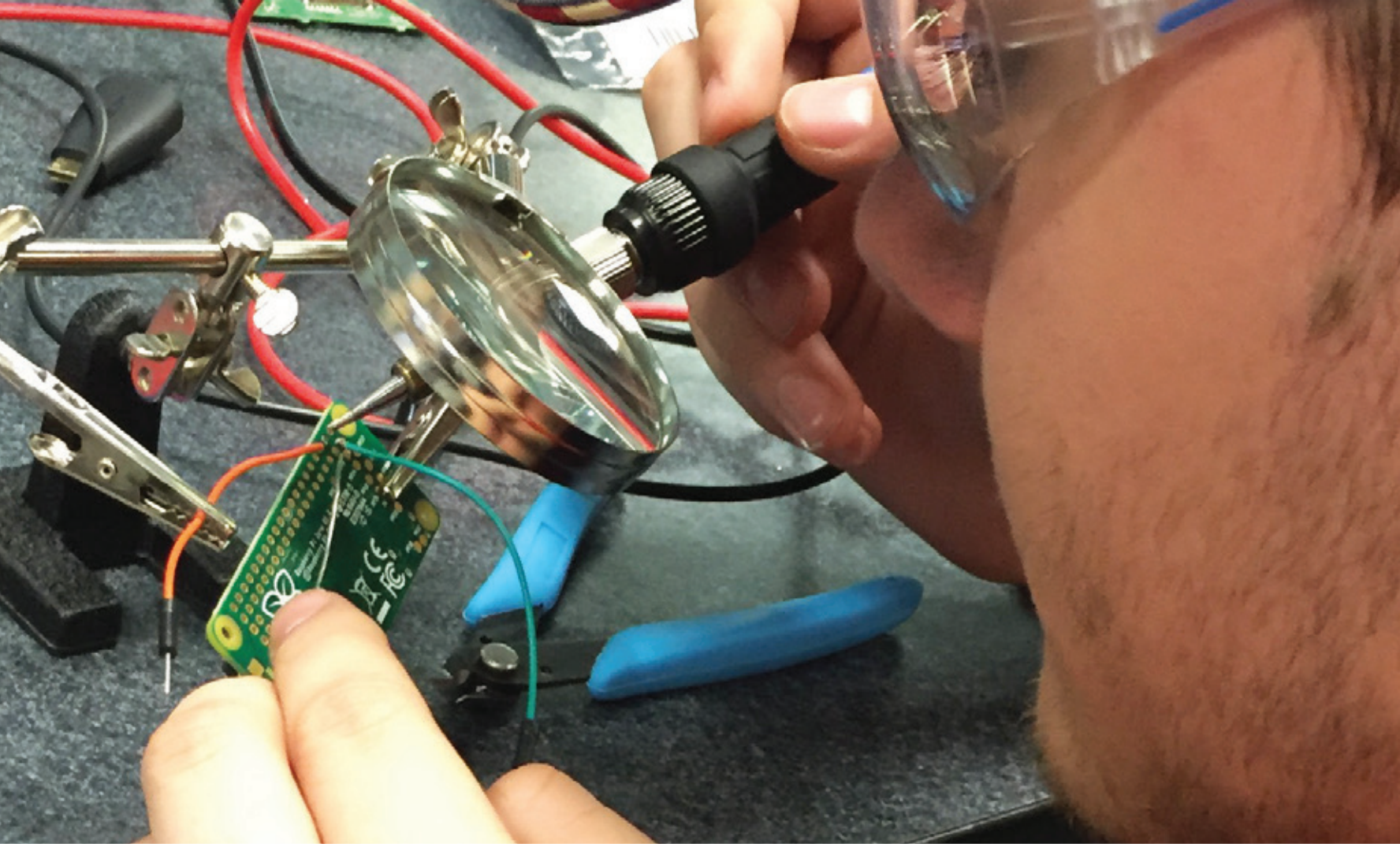
"I believe that to truly foster innovation and entrepreneurship on campus, we need to have students from all areas working and learning together."

—Puckett

Puckett, an advertising and promotions major, hopes to better connect students from different areas in interdisciplinary projects and research.

"I believe that to truly foster innovation and entrepreneurship on campus, we need to have students from all areas working and learning together," she says.

"So far, working with Nathan and other students through the Innovation Club, I have learned so much from students outside my major. Because of this experience, I think differently, with more creativity, because I see things from a different perspective."



WMU's Innovation Club, a student group, has "makers' spaces" on campus. The spaces are outfitted with tools and raw materials, such as 3D printers and wiring, that students can use for various projects.

LaWarre also credits the Innovation Club and other opportunities for entrepreneurship on the WMU campus, including Starting Gate, student project labs at the College of Engineering and Applied Sciences, WMU's entrepreneurship minor and student research grants.

Impacting campus

"Learning doesn't stop at the ending of our (University Innovation Fellows) training. Hopefully, we will be able to make an impact on WMU's campus and fuel the entrepreneurial spirit."

With the addition of this year's fellows, the University Innovation Fellows program has trained 1,000 students at 185 schools since its creation. Fellows are sponsored by faculty and administrators as individuals or teams of students and selected through an application process twice annually.

Following acceptance into the program, schools fund the students to go through six weeks of online training and travel to the annual University Innovation Fellows Silicon Valley Meetup. Throughout the year, they take part in events and conferences and have opportunities to learn from each other, Stanford mentors, and leaders in academia and industry.

LaWarre, an active member of the Sunseeker solar car team at WMU, works as a tutor at Kalamazoo high schools and at an architectural engineering firm as an intern. He hopes to one day work in the renewable energy field, researching and creating more efficient sources of energy.

"Through our training, we found you can implement design thinking into anything."

—LaWarre

Puckett works as an office assistant in the WMU Office of the Vice President for Research. This summer she's been working as an intern in marketing at Amway in Grand Rapids, Michigan. After graduating in spring 2018, she plans to pursue a master's degree in market research. ■

For information on WMU's fellows, visit universityinnovation.org/wiki/Western_Michigan_University_Student_Priorities.

A virtual world for flight

Adding a new dimension for learning, a tablet loaded with augmented reality software overlays virtual images and information onto real-world objects; in this case, a jet propeller.

Particularly in light of a fast-approaching shortage of skilled aviation professionals, the aviation industry may be an increasingly attractive and viable career option for students interested in becoming tomorrow's pilots and technicians.

Brown

Aviation Week & Space Technology, for instance, forecasts that with the Federal Aviation Administration-mandated pilot retirement age at 65, the U.S. will be short close to 20,000 pilots by 2022. Meanwhile, international aviation giant Boeing expects that nearly 1.5 million pilots and technicians will be needed by 2035 globally.

To help replenish the field with well-prepared and ready-to-work aviators and technicians, Lori Brown is exploring advanced educational technology to meet the learning styles and needs of the next generation.

A new approach to teaching

The associate professor of aviation says that because today's students generally have great facility for using computer technology and also require engagement in the classroom that goes beyond lecture and slide presentations, she's working to bring immersive experiences such as augmented reality to learners who aspire to pilot or service planes.

Augmented reality, or AR, overlays computer-generated virtual images onto physical objects and two-dimensional images.

"AR takes our real work environment and overlays digital content such as 3D images, checklists, airspace graphics, part numbers, procedures or manuals which creates a 'mixed reality' environment," says Brown, who teaches advanced aircraft systems and airline flight operations.

Not just in the classroom, but in industry, she says that AR promises to transform "the way we train to operate and maintain aircraft—allowing us the ability to enhance real-world environments to accelerate learning and increase situational awareness."

According to recent research, she says, people trained with the help of 3D maintain better situational awareness, and they have improved skill performance as well as improved long-term retention and recall.

"This approach, combined with customizable mobile applications, creates engaging interactive, experiential learning and immersive experiences."

She's found that "mixed reality" encourages students to practice and more quickly progress to advanced skills. It also bridges the gap between flight simulators and the classroom.

Industry informed

Brown came to WMU after working in airline management, as an airline transport pilot for commercial airlines and simulator instructor.

She developed a love for teaching while working for Flight Safety International as a ground and flight simulator instructor. So, it was a natural transition to come to WMU in 2001 as a simulator instructor and WMU International Pilot Training Center classroom instructor for cadets from British Airways and other airlines.

"I'm grateful for my years in the industry, as this has allowed me to bring real-world applications into the classroom and share my passion along with lessons learned with my students," Brown says. "This experience also allows me to better understand some of the challenges my students may have in their future careers."

She's developed a strong passion for education and enjoys merging industry needs and technology with the classroom environment.

"It's with that understanding that I'm driven to connect the classroom with the application of technical-driven education used in the industry."

Key collaborators

Brown says that teaming up with colleagues in engineering and computer science as well as receiving WMU grant awards that support instructional development have been key to her efforts to advance educational technology for her students.

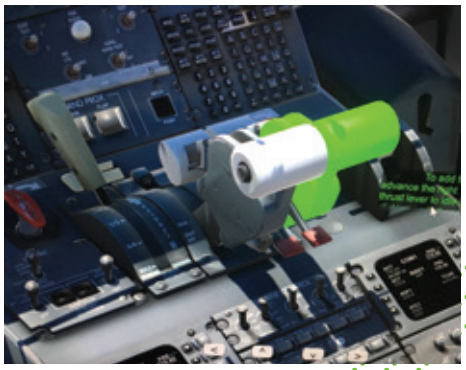
"Along with my colleagues from engineering and computer sciences, Dr. Ala Al-Fuqaha, Ihab Mohammed, Gregory Ostroy and Dennis McFall, we started with interactive scalable vector graphics and now have moved into 3D virtual, augmented and mixed reality," she says. "We have developed 3D interactive cockpits for commercial aircraft and several jet engines by using each grant award to help build a new platform."

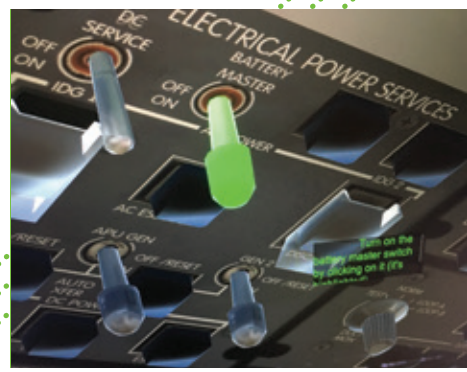
That group of enterprising faculty members now has a suite of educational tools for students, including virtual reality goggles, smart glasses featuring augmented reality and HoloLens holographic capability, thanks to WMU web developer William Chheu.

Currently, Brown is at work with Dr. Ronald Sterkenburg from Purdue University on a state-of-the-art textbook, which has AR overlays. The book is a unique learning tool that helps pilots bridge the gap between aircraft systems theory and operations.

With help from AR, students can view two-dimensional objects in 3D by using the camera embedded in their iPhones or tablets. They simply scan the images in the textbook, and those 2D images are reconstituted on their smart phones or tablets as 3D models or videos.

"These enhanced technologies can improve learning outcomes and student assessment, and change the way we interact with technology while engaging our students," Brown says. "It's all about preparing our students to be successful to meet the needs and challenges of tomorrow." ■





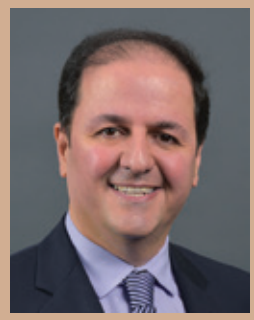
The inside of a cockpit is enhanced for aviation students with computer-generated images.

A bandage so 'smart' it can communicate with doctors

Typical bandages protect a wound from external elements and, when needed, also help keep topical medicine in place while the body heals.

But what if a bandage could aid healing even more actively and also give doctors a report on the treatment?

A WMU professor and research associate in engineering are part of a multi-university, multidisciplinary team developing a "smart bandage" designed to treat chronic wounds.



Atashbar

Dr. Massood Atashbar, professor of electrical and computer engineering, says this high-tech bandage is "smart" in two ways:

The bandage can deliver oxygen at high concentrations as well as administer medicine and other types of therapies directly to damaged tissue, all with the goal of accelerating healing.

Additionally, the dressing is embedded with flexible sensors that can monitor oxygen levels and other data and wirelessly send that information to a clinician. Oxygen monitoring is key because while highly concentrated oxygen aids healing, too much can damage tissue.

But these smart bandages are only intended for certain types of skin damage, not for the kind of scrapes or cuts that heal without extensive wound management.

"They are for chronic wounds," particularly difficult-to-heal injuries, such as burns, Atashbar explains. "We're aiming for dressings to be on the patient for 12 hours minimum."

Atashbar brings to the smart bandage research and design team an extensive background in the development and fabrication of sensors. At WMU, he leads the Center for Advanced Smart Sensors and Structures in the College of Engineering and Applied Sciences. Also working on the project from WMU is Dr. Binu B. Narakathu, a research associate for the center.

Leading the team is Dr. Babak Ziaie, professor of electrical and computer engineering at Purdue University in Indiana.

Currently, prototypes of the smart bandages are being tested in the laboratory and with patients by the third university-based member of the team, Dr. Michael Zieger, associate research professor of surgery at the Indiana University School of Medicine.

Integra LifeSciences, a New Jersey-based medical device company, is the industry partner on the project. ■

Safe sleep. Safer babies.

According to the Centers for Disease Control and Prevention, there were about 3,700 sudden, unexpected infant deaths in the U.S. in 2015. A quarter of these fatalities were due to accidental strangulation and suffocation in bed.

Dr. Cheryl Dickson, as head of the Safe Sleep task force for Cradle Kalamazoo, has been leading efforts to improve education and raise awareness about safe sleep practices as a means of preventing infant deaths and lowering the infant mortality rate in Kalamazoo.

Dickson

Now, the work by Dickson, the associate dean for Health Equity and Community Affairs at the WMU Homer Stryker M.D. School of Medicine, and others has been bolstered by a one-year, $107,636 grant from the United Way of the Battle Creek and Kalamazoo Region.

The funding will support a training program for home visitation health providers to enhance their ability to deliver information to families about safe-sleep practices in a way that is culturally competent, more effective and more likely to be used and accepted.

Though unsafe sleep environments are a leading cause of infant death, Dickson says those deaths are completely preventable.

The training for the providers will be made up of multiple sessions, including scenarios in the Simulation Center at the medical school's W.E. Upjohn M.D. Campus where the providers will work with the center's standardized patients.

"We're really going to be looking at whether this impact is effective and causes a change in behavior and outcomes," Dickson says. "We're really excited about this grant."

The training for home visitation health providers represents the next step in the Safe Sleep initiative, which is part of Cradle Kalamazoo. Previously, the Safe Sleep task force created a safe sleep toolkit and members have presented safe-sleep recommendations to health providers and organizations in the community.

Cradle Kalamazoo is a collaborative community initiative that is being led by YWCA Kalamazoo. The medical school is one of several partners in the initiative, which seeks to reduce infant deaths in Kalamazoo and promote respect for families, women and children through evidence-based and holistic interventions.

Currently, the infant mortality rate in Kalamazoo County is one of the highest in the state and while the overall infant mortality rate has decreased over the last three decades, the disparity among babies of color and white babies has increased. In Kalamazoo, for example, babies of color are four times more likely to die before their first birthday than white babies.

In addition to Dickson, Dr. Catherine Kothari, assistant professor for biomedical sciences and director of the Community Research Section within the medical school's Division of Epidemiology and Biostatistics, has played a key role in Cradle Kalamazoo. In November, Kothari was named the recipient of a one-year, $193,000 grant from the United Way that is serving as the "data backbone" of the infant mortality reduction initiative.

"This is a great example of a collective impact model," Dickson says. "We've actually had success because of Kalamazoo and how we've come together."

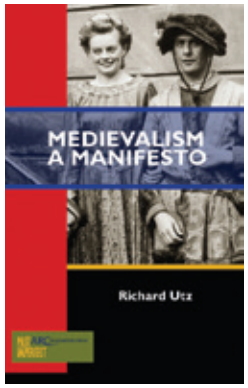
Along with the curriculum and training for the home visitation health providers, Dickson said there will be a follow-up component focusing on how the providers fare in delivering information about safe sleep practices to families and whether the information results in an improvement in the racial and socioeconomic disparities that exist with infant mortality due to unsafe sleep practices.

"I hope we are able to impact the home providers in a way that they feel comfortable having conversations with the clients they serve," Dickson says. "We're promoting this awareness and ultimately you're going to prevent a death." ■

Two new medieval book series could captivate public, scholars alike

For those who agree with Shakespeare that "What's past is prologue," WMU's Medieval Institute Publications, or MIP, has a new book series called Past Imperfect. It offers short-form books that focus on the Middle Ages and are written in scholarly-yet-edgy and accessible language.

MIP also has launched Ludic Cultures, 1100-1700. This new series illuminates the complex phenomena of medieval and early modern play, toys and games. The first volume in the series, "Playthings in Early Modernity: Party Games, Word Games, Mind Games," was published in February.



Past Imperfect

Dr. Simon Forde, MIP's most recent director and editor-in-chief, said that more than 40 volumes have been commissioned for Past Imperfect from scholars across North and South America, Europe and Australasia.

"Short-form publications meet an increasing scholarly need to publish concise summaries of research—35,000 words and 100-plus printed pages—that are aimed at engaging more broadly with the public while also serving the needs of college curricula as well as undergraduate students, graduate students and scholars who want an introduction to specific topics," Forde said.

"Across the world, people remain fascinated by the Middle Ages, whether it's 'The Hobbit' or 'Game of Thrones.' It was the period of the Islamic Golden Age and when civilizations in India, China, across Africa and in Central America were often more advanced than the West," he continued.

"Past Imperfect offers an affordable overview of a full range of subjects spanning the time period and proves that the era still retains a powerful resonance and impact throughout the world today."

In addition to its first three volumes (see list above, at right), three more Past Imperfect books will soon be published, including a work about Alfred the Great and another on medieval demons. Many of the series' future volumes focus on Islamic and Middle Eastern history and the social impact of medieval studies today.

Printed volumes can be purchased for $14.95, and e-books are available on Amazon.

The first three volumes of Past Imperfect:

- "Medievalism: A Manifesto," covering the history of the medieval studies discipline. It was authored by Dr. Richard Utz, chair and professor of literature, media and communication at the Georgia Institute of Technology. Utz is a former English professor and department chair at WMU.
- "The Scholastic Project," which focuses on scholasticism. Its author is Dr. Clare Monagle, senior lecturer in modern history, politics and international relations at Macquarie University in Australia.
- "Today's Medieval University," a work that examines the history and impact today of medieval university structures. It was written by Dr. Jane Toswell, professor of English at Western University in Ontario.

Ludic Cultures, and other series

"Playthings in Early Modernity" is the first volume in the Ludic Cultures, 1100-1700, series. Edited by art historian Allison Levy, the book is described as "an innovative volume of 15 interdisciplinary essays at the nexus of material culture, performance studies and game theory."

The volume "emphasizes the rules of the game(s) as well as the breaking of those rules." A "plaything," as referenced in the title, is understood as both an object and a person. And play "is treated not merely as a pastime, a leisurely pursuit, but as a pivotal part of daily life, a strategic psychosocial endeavor." This new volume is available for $119.

Forde says there are other MIP book series on the horizon, including one that explores the history of food and another on medieval monsters. ■

For more information about MIP and its book series, visit wmich.edu/medievalpublications.

WMU's Medieval Institute Publications, a member of the Association of University Presses, has been in operation in its present structure since 1978.

Heralded British historian wins Gründler Prize

Jonathan Sumption, a celebrated British judge, author and medieval historian, has won WMU's 2017 Otto Gründler Book Prize for the fourth in his series of books about the Hundred Years War. The work is titled "The Hundred Years War, Volume IV: Cursed Kings."

This year's prize, which comes with a $1,000 cash award, was announced in May at the 52nd International Congress on Medieval Studies—the world's largest gathering of medieval scholars, which is held annually on the WMU campus.

The prize is named for the late longtime director of WMU's Medieval Institute and has been awarded annually since 1997. It is designed to recognize a book or monograph on a medieval subject the selection committee determines has made an outstanding contribution to the field. Authors from any country are eligible for the prize, and nominations are accepted from readers or publishers.

Sumption's book focuses on the period of 1399 to 1422, a time that saw particular chaos in both Britain and France. It begins with the deposition of King Richard II of England and civil war in France and ends with the deaths of two other kings--Henry V of England and Charles VI of France.

"The book ventures from battles and 'cursed kings' to survey society, personalities, politics and economics," Dr. Jana K. Schulman, director of Medieval Institute, said in reading this year's award citation.

"Sumption's thorough and lively examination of a short period of time in the Hundred Years War—just 23 years—is well deserving of the 21st Otto Gründler Prize."

Published by the University of Pennsylvania Press, Sumption's 907-page book has received acclaim in the popular press. The Guardian newspaper in London called it "a 'Game of Thrones' history with plenty of crazed kings, martial heroes, dastardly betrayals, silky clerical types and prisoners rotting in foul dungeons. It is difficult to see that anyone could do this type of history better than Sumption."

Sumption is a former history fellow at Oxford and a justice of the Supreme Court of the United Kingdom. He is the author of a number of books on topics such as the Crusades and pilgrimage. ■

Ransomware wake-up call: Update—**or else**

Ransomware, malicious software that blocks off a victim's computer data until a ransom is paid, is an all-too-common modern malady.

But an attack that spread to more than 150 countries and shut down many businesses and organizations earlier this year had an added level of deviousness in how it was delivered.

Typically, cyber attackers send you an email with an attachment in an attempt to get your computer data into their clutches. If you open the attachment, your computer becomes infected.

"The big deal with this attack is it's delivered via a protocol called SMB," says Dr. Alan Rea, a professor of business information systems.

Users in networked environments often share files between computers, and that's how this malicious software spreads.

"And it's a worm, so this worm is propagating itself, looking for other computers that have this port open for this protocol, sending it to that computer and then that computer gets infected. So, you do not have to do anything but be connected," Rea says.

He notes that the malware, dubbed WannaCry, was reportedly developed by the U.S. National Security Agency and was subsequently stolen and released by a hacking group known as Shadow Brokers. Though WannaCry has stopped spreading, for the most part, variations are still circulating.

The attack is a wakeup call for organizations.

"I think as an organization, the best you can do is make sure your system is up to date," Rea says. "We always talk about user training, and that's important, but in this respect, to be honest, the user training that we normally use for security awareness wouldn't have helped, other than keeping your systems updated."

Rea says it's important for businesses and other organizations to install patches released by computer software companies. Knowing a potential problem existed, Microsoft issued a patch in March, but many users failed to install it. The ransomware infected mainly systems using outdated software.

"No matter what OS you use, keep it updated," Rea says. "These are patches that the organizations put out, whether it's Microsoft, Apple, whatever it is you're using, make sure you update it." ■

A BOOST to keep succeeding

Longtime partnership among Michigan research universities has advanced the college careers of thousands of students underrepresented in STEM fields

60%

Together, the four universities have seen an increase in the number of underrepresented minority students earning STEM degrees since the program launched in 2006.

As a mechanical engineering researcher and doctoral student at Virginia Tech, Mark Pastor Hurtado is, by objective measure, an accomplished young man.

But, at one time, Hurtado was an even younger student concerned that he had no idea what it would take to attain success in college and career.

In that critical period of a would-be college student's life, a period that can set a student up to persist through college—or not, "I had a lot of questions, but no one to ask them to," Hurtado recalls.

Then he came to WMU in 2010 and got involved in the Michigan-Louis Stokes Alliance for Minority Participation program, an initiative that has helped advance thousands of students through higher education and onto achievements after graduation.

A launch pad for accomplishment

"LSAMP provided me with the platform that I needed to ask these questions and to find the answers," says Hurtado, who was the first in his family to go to college.

Alumnus Mark Pastor Hurtado is flanked by Dr. Andrew Kline, WMU's LSAMP director, and Dr. Betsy Aller, LSAMP program manager.

"I also became involved with LSAMP because I wanted to be better prepared for my first year at WMU." And that's just what happened; he recalls how the program's "mini courses" helped him improve his skills in math, physics, writing and chemistry before beginning his freshman year.

MI-LSAMP is a 12-year partnership among four research universities: the University of Michigan, Michigan State University, Wayne State and WMU. A second phase of the program launched in 2011 and added nine Michigan community colleges.

The overarching Louis Stokes program is a national initiative that dates back to the early 1990s and is housed in the National Science Foundation. Its primary mission is to significantly increase the number of underrepresented minority students earning baccalaureate degrees in science, technology, engineering and mathematics, or STEM, disciplines in the U.S.

The man for whom the program is named, Stokes, was the first African-American person from Ohio to serve in Congress. He was a champion for equality in a number

of realms of American life and advocated for funding that would boost the number of minorities in STEM professions.

Since the program's inception in Michigan in 2006, the four research universities involved have together seen a 60 percent increase in the number of underrepresented minority students earning STEM degrees.

To reach the finish line

At WMU, behind this effort to engage underrepresented students and to help these students navigate the college experience successfully is a group of passionate educators who developed thoughtful programming to boost student achievement.

LSAMP at WMU, for instance, offers the Science Pre-First Year Program for students admitted to the University and majoring in a STEM degree program. During this four-week experience, participants are exposed to daily classes in chemistry, biology, mathematics, and academic preparation or study skills.

"The experience introduces students to engineering and science material that they will encounter during the first year of college," explains Dr. Andrew Kline, associate dean for research and graduate education and the LSAMP site director at WMU.

LSAMP at WMU engages with 65 unique students each project year, with some students participating in undergraduate research, the pre-first year program and other academic year events.

"Our goal is to try to give our students that boost to keep them in school so they get to the point they get a four-year degree," Kline says. "If it's not engineering, chemistry or biochemistry, even if they change their majors from engineering or science to business information systems or psychology, that's great. We just want them to complete their degrees. It's about them reaching the finish line."

LSAMP's methods for recruiting, building community and mentoring—including student-to-student mentoring—has become part of the larger culture at WMU, one of the goals of the NSF program.

"The mentorship MI-LSAMP provided was important," recalls Stephanie Brown, a 2008-2012 LSAMP participant who graduated from WMU with a degree in biomedical sciences. She's now in her fourth year at Meharry Medical College School of Dentistry in Nashville, Tennessee.

"Many students go off to college and they don't have those people around them who are pushing them to succeed and ensuring that they are keeping up on their studies."

She says the program also exposed her to opportunities she might not have otherwise envisaged as an undergraduate.

"LSAMP exposes you to research opportunities, stipends, mentorship, poster presentations and leadership experiences," Brown says. "I participated in research through LSAMP Summer Research at Wayne State University (one of WMU's partners) in the biomedical engineering department. It was very meaningful because it challenged me and allowed me to be hands on."

$

10 Million

Since the program's inception in Michigan, the state's four top research universities have received $10 million over the three phases, with each university responsible for the implementation of its portion. WMU has received almost $1.3 million in total. Dr. Edmund Tsang, associate dean for undergraduate programs and assessment of the College of Engineering and Applied Sciences at WMU, is the alliance's co-principal investigator.

Collegiate, but also career-minded

Hurtado says that access to research opportunities as an undergraduate was crucial for him, too.

"I applied and was selected to participate in the MI-LSAMP Summer Research Academy at MSU in 2011. This opened a lot of doors for me as an undergraduate student because it gave me work experience that I later needed to participate in... a summer internship at DTE Energy and a co-op at DENSO Manufacturing Michigan."

There's also the research and industry connection.

Herman Washington, a 2015 mechanical engineering graduate, is currently working for Consumers Energy as an engineering liaison for gas distribution regulation and compliance, interfacing with the Michigan Public Service Commission.

"Our LSAMP group went on a number of industry tours that were my first taste of the STEM industry firsthand," Washington says. "It allowed me to meet with professionals, ask questions, and see various company assets and environments. This gave me goals to strive for and equipped me with a knowledge base of expectations to keep in mind while completing my academic career." ■

Computing at the scale of Google

Read, research, develop. Repeat. That loop is computer engineer Kevin Khaw's recipe for staying at the cutting edge in his field.

Living on the leading edge of innovation is the only option when you're helping to advance a company often heralded as—and expected to be—one of the world's most innovative internet enterprises.

Khaw

Kevin Khaw is an engineer manager at Google in Mountain View, California. The two-time WMU graduate manages operations for the tech giant's cloud developer platform.

In cloud computing, individual consumers and businesses use pay-as-you-go computing infrastructure and software services hosted by, in Google's case, its massive infrastructure—what Khaw characterizes as "computing at the scale of Google."

Cloud computing "is poised to change information technology as we know it, and I'm happy to be part of the next wave of technological innovation on the internet," says Khaw, who's been a "Googler" since 2006, about a year after he earned a master's degree from WMU's engineering management program. He completed his bachelor's degree in computer engineering in 2002.

During the past 11 years, he's seen Google mature as the most popular search engine while it also advances into new services and products. Though he cannot talk about his specific projects, he says that today, as part the company's expanding cloud computing business, "It is by far the most exciting time at Google."

Originally from Malaysia, Khaw came to WMU in 2000. It's been more than a decade since graduation, but he maintains ties with faculty and staff at the College of Engineering and Applied Sciences as well as with staff in the Office of Information Technology, where he worked while at the University.

"Many have had a huge impact in my life. I wouldn't be where I am at today if it were not for these handful of individuals. I still keep in touch with all of them. I had the chance to come back to WMU in October 2016 and thank all of them for helping me throughout my years at WMU," he says.

Last fall, Khaw was inducted into the engineering college's Alumni Excellence Academy. In December, he's scheduled to return to address students at the college's Innovation Day. He was invited by two of his mentees—Nathan LaWarre and Jill Puckett, WMU's resident student Innovation Fellows.

Mentorship is important to Khaw. As an engineering mentor, he's part of a program at Google that helps new Googlers—also known as "Nooglers"—navigate the company.

"Whenever possible, I try to give back and share my experiences to several communities, which includes WMU. I share experiences right from the company that is at the forefront of technological innovation and creativity," he says.

His counsel to up and comers in his field is to take advantage of what modern computer technology offers.

"The increased access and low cost of adopting new technology is allowing anyone to innovate, create and explore new fields that were once off limits to the average person.

"Don't be afraid to take risks and fail," he adds. "It is the best way to learn."

Outside of work, Khaw says he loves spending time with his wife and kids—and gardening to get away from technology.

"I try to get my hands full of dirt so that I can't touch my phone or laptop." ■

From soldier to scientist continued from page 19

A professor suggested he consider taking on another challenge by pursuing research as part of his undergraduate education. Hentig read through biology faculty profiles and found that Byrd-Jacobs' research had implications for neuroregeneration and traumatic brain injury.

"I looked no further," he says.

Researching regeneration

Byrd-Jacobs is interested in how the adult central nervous system can recover function after damage, using the olfactory system of zebrafish as her research model.

She is investigating regenerative abilities of zebrafish to learn whether there's a way to also regenerate damaged human neurons.

Reading about that work, Hentig says "it was a sudden realization that for people like me who struggle, there are people who are working on it."

Though a sophomore with no research experience when he started in the lab, Hentig performed at a higher level than most other undergraduates Byrd-Jacobs had mentored.

"He just kept achieving," she says.

"I think his experience with brain injury was a huge motivator. He's driven by the desire to make a difference. He wants to make sure future soldiers don't have to go through the things he went through."

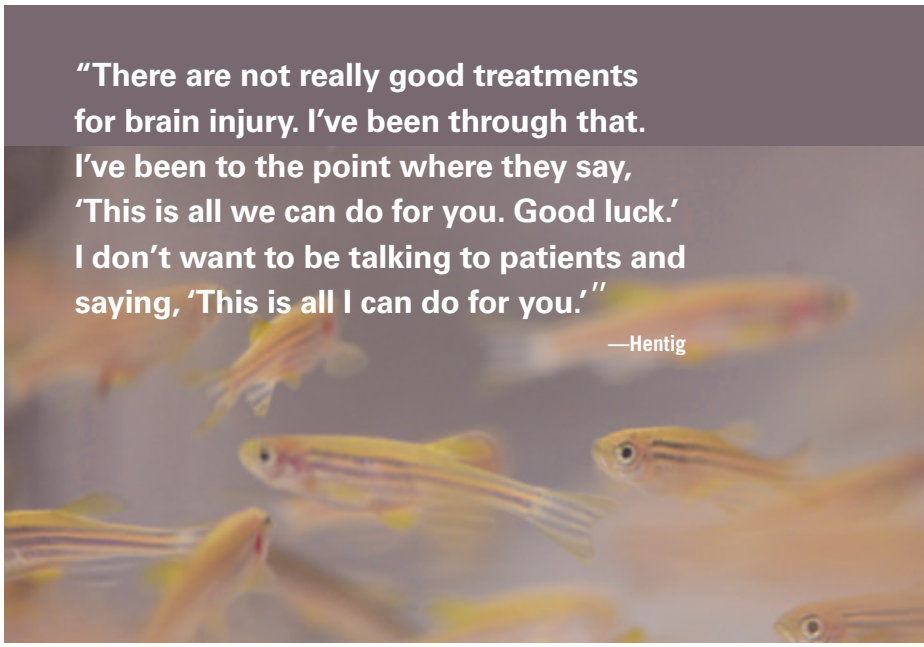
As Hentig took on greater responsibility in the lab, he became the principal author on a published research article—an atypical feat for an undergraduate—based on a study Byrd-Jacobs entrusted him to conduct.

Byrd-Jacobs

"That was a big part of getting me to Notre Dame," he says. "I was able to speak in depth when I went on an interview because it was my work. It's a large milestone. There are a lot of people who are three or four years into a Ph.D. program and still don't have a first-author credit."

He credits Byrd-Jacobs for his advanced skillset and resume. "She taught me how to design my experiments, how to answer questions and how to analyze results, but that was the minimum. She went above and beyond."

It was working alongside the WMU scientist that changed Hentig's mind about medical school, about where he felt he could do the most good.



"There are not really good treatments for brain injury. I've been through that. I've been to the point where they say, 'This is all we can do for you. Good luck.' I don't want to be talking to patients and saying, 'This is all I can do for you.'

"I started seeing that it's research that creates new medicine, and what I was really more interested in was translational medicine. I'd much rather be the person spending his life creating treatments so that in 20, 30, 40 years, a doctor can say, 'There's this one thing I can try versus there's nothing I can do.'"

At Notre Dame, Hentig is working under Dr. David Hyde, who studies the mechanisms underlying retinal development and regeneration in adult zebrafish. Hentig brings a new research track to the lab by investigating brain cell degeneration and regeneration, specifically following blunt-force trauma.

"What I want to know is: How do (zebrafish cells) regenerate and why do they regenerate. What's allowing them to regenerate? What factors (genes) do they have that are turned on that we also probably have but that are turned off?"

The notion of "turning on" those possibly latent abilities seems far-fetched today, he says. But as someone with experience achieving what seems unlikely, Hentig believes it's possible. ■

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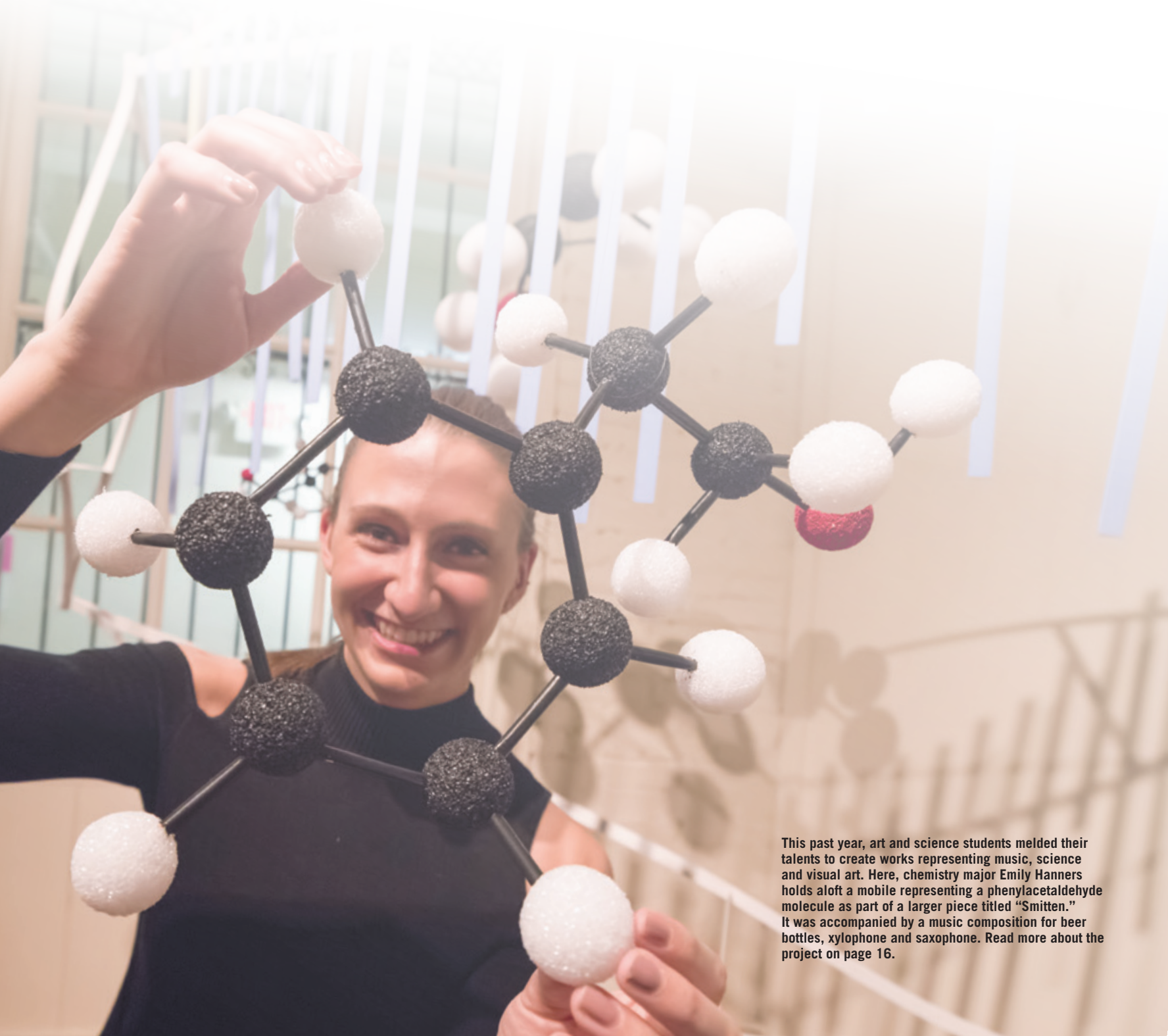

This past year, art and science students melded their talents to create works representing music, science and visual art. Here, chemistry major Emily Hanners holds aloft a mobile representing a phenylacetaldehyde molecule as part of a larger piece titled "Smitten." It was accompanied by a music composition for beer bottles, xylophone and saxophone. Read more about the project on page 16.